Description

Modular service device

The invention relates to a modular service device.

The Phoenix product catalog entitled "Leiterplattenanschluss COMBICON 2002" [COMBICON 2002 printed circuit board connection] discloses, for example on pages 3 and 318, a modular installation device which is provided with a housing and a top-hat rail holder and has removable screw terminal blocks which are provided with block-standardized coding for the purpose of supplying the blocks in the correct position, claw-like projections for the purpose of fixing them to the housing and contact needles with which contact is to be made axially. Such an installation device is used, for example, as a rail-mounted device in a switchgear cabinet and acts as a switching and/or protective switching device, signal converter or the like for the purpose of converting switching and/or control concepts.

The invention is based on the object of specifying a service device which can be equipped with connection modules and has a contact means, and in the case of which the possibly voltage-carrying contact means for the purpose of making contact with the associated connection modules is protected against unintentional touching contact using simple means.

This object is achieved according to the invention by the features of patent claim 1; advantageous refinements are in each case the subject matter of further claims.

The use of an insulating means which is arranged on the end and/or longitudinal side on the respective contact means also ensures, using simple means, protection against touching contact in accordance with regulations, in particular at the locations for modules on the service device,

as regards the exposed and possibly voltage-carrying contact means even when the connection module has been removed.

The insulating means are advantageously arranged such that the corresponding contact means are covered on the end and/or longitudinal side, as a result of which the exposed surfaces of the contact means can be reduced.

The respective insulating means may also be in the form of an insulating bracket, in particular in the form of a plug-in element which can be integrated in the housing, and by means of which the contact means to be covered in order to protect against touching contact can be made safe in a simple manner.

The invention and advantageous refinements in accordance with the features of the further claims will be explained in more detail below with reference to exemplary embodiments illustrated in the drawing, in which the figure shows a perspective illustration of a service device having arranged connection modules and further connection modules which can be arranged.

The figure shows a modular service device 1 having a housing 2 which advantageously has a schematically illustrated electrical, electromagnetic or electronic device unit 3. The intended use of the service device 1 can be determined by the replaceable device unit 3. The service device 1 has a retaining means 4 which is integrated in the housing 2 and is provided for a bearing means 5, in particular a top-hat rail, which can be coupled to said retaining means 4. The bearing means 5 is mounted, for example, in a distribution board, switchgear cabinet or the like, with the result that the service device 1 which has been snapped onto it has a fixed installation position.

The service device 1 or the housing 2 is also provided with two or more module locations 6a-6d, a first and a second module location 6a and 6b being provided

on an end side of the housing 2 for a first and second connection module 7a and 7b, respectively, which can be arranged at said module locations 6a and 6b. A third and a fourth module location 6c and 6d, which are arranged on another end side, are each fitted with an associated third and fourth connection module 7c and 7d, respectively. It is therefore not necessary to completely replace a device in the event of a defect in or maintenance work on a wired device. Such a complete replacement would also require all of the connection means or all of the lines to be detached.

In a manner representative of the other connection modules 7b-7d, the connection module 7b is advantageously provided in each case with a multi-pole connection means. Two embodiments of the connection module 7b show firstly a simplified illustration of the screw terminal 8a and secondly a simplified illustration of the spring-loaded terminal 8b as the connection means. Of course other embodiments, such as an insulation displacement contact or the like, can be used. The connection means are each determined for a single- or multi-core line (not illustrated here) which can be connected thereto.

A first and a second coding means 9a and 9b are provided on a housing wall at the first and the second module locations 6a and 6b, respectively. The two coding means 9a and 9b each correspond to an associated first opposing coding means 10a and to a second opposing contact means (not illustrated here), respectively. The first opposing contact means 10a and the second opposing contact means are part of a first and a second connection module 7a and 7b, respectively. Both the contact means 9a, 9b and the first opposing contact means 10a and the second opposing contact means serve the purpose of providing module location-specific assignment, i.e. assignment which cannot become confused, of the first and second connection module 7a and 7b, respectively, on the housing 2.

The same applies to the third and fourth module locations 6c and 6d which are each provided with a third

and a fourth coding means 9c and 9d, respectively. The third and fourth coding means 9c and 9d are each compatible with an associated third and fourth opposing coding means 10c and 10d, respectively, of the third and fourth connection modules 7c and 7d, respectively, which can be arranged. The coding means 9a-9d at the module locations 6a-6d of the housing 2 and the opposing coding means 10a-10d on the connection modules 7a-7d are therefore coded overall with respect to one another in a simple manner. This applies both to connection modules on one connection side and to connection modules on different connection sides, with the result that an assignment error and therefore, under certain circumstances, destruction of a device can be avoided.

In this case, by way of example, the first coding means 9a of the first module location 6a is formed by four recesses in the housing wall which are formed by housing sections. The recesses or else apertures are different in terms of their locations, positions and/or dimensions than those of the second coding means 9b for individualization purposes. The first opposing coding means 10a is in this exemplary embodiment in the form of a bracket element and is designed in terms of its location, position and/or dimensions so as to correspond to the recesses in the first coding means 9a, with the result that it is not possible for it to be confused with, for example, the second or third connection module 7b or 7c.

The bracket elements advantageously act at the same time as fixing hooks for the connection modules 7a-7d on the housing 2 of the service device 1. The same naturally also applies to all other module locations 6b-6d and connection modules 7b-7d, an individual design for the respective coding means 9b-9d and the corresponding second or third and fourth opposing coding means 10c and 10d being provided per module location 6b-6d. In a further refinement, the coding means 9a-9d can also be provided

on the respective connection modules 7a-7d, the opposing coding means 10a-10d being arranged on the housing 2 with a suitable alignment.

The first module location 6a also has, on the end side, a latching means 11 in the housing wall of the housing 2. The third module location 6c is likewise equipped with such a latching means (not illustrated here). An opposing latching means 12, which, in interaction with the latching means 11, serves the purpose of providing module location-specific locking and unlocking of the first connection module 7a in the sense of a locking mechanism, is provided on the first connection module 7a. Unintentional release of the first connection module 7a is thus ruled out. Even in the event of tensile forces occurring, which may be introduced via a connected line, release of the connection modules is ruled out. This is of significance insofar as release under load conditions may lead to contact erosion and to overheating and, in the most unfavorable case, to destruction of the device owing to a resultant arc formation. The same similarly applies to the third connection module 7c, the latching means 11 latching with the opposing latching means 12 once the connection modules 7a-7d have been pushed on. The latching means 11 is in the form of an elastic latch having a barb. The lock for its part comprises integral or multi-part, resilient elements.

The latching means 11 is advantageously part of the housing wall, as a result of which a simple embodiment which has reduced manufacturing complexity is provided. The opposing latching means 12 is also advantageously of simple design, namely in the form of a latch accommodating the barb. In the context of the invention, the lock can also be integrated in one of the connection modules 7a-7d or the latch can be integrated in the housing 2 of the service device 1. The latch which is in the form of a recess in a wall of the first connection module 7a is arranged at one end of a ramp 13, by means of which the lock can be released, for example by means of a screwdriver.

A slot-shaped receptacle 14 for a closure element 15 which can be inserted therein is provided at another end of the ramp 13. The closure element 15 in the inserted state blocks the access to the lock and thus prevents unlocking of the locking mechanism, with the result that undesired disassembly or removal of the first connection module 7a can be prevented. Owing to the physical overlapping of the first connection module 7a with respect to the second connection module 7b in the state in which it is mounted on the service device 1, a separate locking mechanism for the second connection module 7b is superfluous, since it can be removed only once the first connection module 7a has been released.

A first contact means 16a is arranged on one end side, in particular at the first module location 6a, of the housing 2. A second contact means 16b is provided, analogously to the first module location 6a, at the second module location 6b which is set back in the form of a step. The contact means 16a, 16b which protrude on the end side are part of a so-called contact carrier (not shown here). The contact carrier is placed and fixed on a printed circuit board 17 of the device unit 3. The contact carrier acts, inter alia, as an electrically conductive connection between the contact means 16a, 16b and the printed circuit board 17. The first connection module 7a which is associated with the first contact means 16a is provided with an opposing contact means 18 (illustrated in simplified form) which is arranged within the first connection module 7a behind a cutout in the associated module housing.

The first contact means 16a forms, together with the opposing contact means 18, a connection interface between the service device 1 and the first connection module 7a. The first contact means 16a has a longitudinal side which is aligned with an upper side of the service device 1. When the first connection module 7a is fed to the first module location 6a of the service

device 1 in the direction of the first contact means 16a and along one end side, the

first contact means 16a can make contact with the opposing contact means 18 transversely with respect to the longitudinal side of said first contact means 16a, which results in a perpendicular contact-making direction or vertical coupling and decoupling direction. In contrast to an installation device having a horizontal coupling and decoupling direction with respect to the connection modules, disassembly of the connection modules 7a-7d is also ensured with the present service device 1 in the case of a small spacing between the rows, for example in the switchgear cabinet.

The first contact means 16a is advantageously in the form of a group of flat contact elements, in particular in the form of contact tongues or contact lugs or in the form of contact pins. The flat contact elements are arranged with their flat side parallel to side faces of the housing 2, their number being freely selectable. In order to maintain the compatibility, the opposing contact means 18 is advantageously in the form of a group of fork-shaped contact elements, as a result of which a simple electrically conductive contact connection which favors contact is provided. The opposing contact means 18 is representative of all other opposing contact means of the further connection modules 7b-7d. In this case, a releasable connection to the flat contact elements is provided by means of the fork-shaped contact elements (also referred to as spring contacts or tulip contacts). Similarly, these physical designs are also reproduced at the other module locations 6b-6d or on the other connection modules 7b-7d.

Stamped, bent parts (not shown here), which provide an electrically conductive connection on the one hand to the respective connection means and on the other hand to the corresponding opposing contact means, are integrated, inter alia, in the individual connection modules 7a-7d. An embodiment of the service device 1 can also be realized, of course, with

fork-shaped contact elements, in the case of which the flat contact elements are part of a connection module.

A first and a second insulating means 19a and 19b are arranged in the form of a touching contact protection device on the end and longitudinal side on the first and the second contact means 16a and 16b, for example. The respective insulating means 19a and 19b, in the form of a group of insulating elements, covers the associated contact means 16a and 16b, respectively, with the result that touching contact with the possibly voltage-carrying contact means 16a and 16b, respectively, once the connection modules 7a and 7b, respectively, have been withdrawn is advantageously ruled out.

The insulating means 19a, 19b, which in the present example are in the form of insulating brackets or insulating projections illustrated by dashed lines, ensure that the requirements of relevant standards are adhered to, for example those of EN 61140 "Schutz gegen elektrischen Schlag" [Protection against electric shock]. In one advantageous development, the insulating means 19a, 19b, which are also referred to as finger touch-safe tabs, may also be in the form of plug-in elements which can be integrated in the housing 2. When the housing 2 is appropriately designed with corresponding receptacles, modification of such insulating means can easily be carried out.

The insulating means 19a, 19b are also arranged parallel or perpendicular to the longitudinal side of the corresponding contact means 16a, 16b, as a result of which effective protection against touching contact is provided with little complexity and use of materials. Furthermore, the housing 2 with the insulating means 19a, 19b is in the form of an integral composite, i.e. in the form of a composite with a reduced number of parts. In this case, the composite can be matched to the device-specific requirements by means of a predefinable injection mold. In the context of the invention, the insulating means 19a, 19b can also similarly be provided, in particular in an embodiment with flat contact elements, on

the connection modules 7a-7d.

The feed direction of the connection modules 7a-7d, which is predetermined on the basis of the contact-making direction, in accordance with the

assembly sequence illustrated by means of feed arrows results in the design for the coding and opposing coding means 9a-9d and 10a-10d, the latching and opposing latching means 11 and 12 and the insulating means 19. The coding and opposing coding means 9a-9d and 10a-10d, the latching and opposing latching means 11 and 12 and the insulating means 19 can likewise be realized by embodiments which have the same effect but are different than the previously mentioned means as regards the advantageous exemplary embodiments described.

Coupling and decoupling of the first connection module 7a to the service device 1 takes place, in a manner representative of the further connection modules 7b-7d, essentially perpendicular to the longitudinal axis of the first contact means 16a. Coupling of the respective connection modules 7a-7d to the module locations 6a-6d results in an arrangement which brings about electrical contact-making and a mechanical connection including coding and locking in the sense of an operative connection. This results in comfortable access even in the case of a narrow arrangement of the service device 1, for example between wiring channels in a switchgear cabinet.

As long as one or more of the connection modules 7a-7d are intended to be removed for repair or modification purposes, first unlocking of the locking mechanism takes place by means of a tool. In this case, the barb of the lock is pressed out of the latch, and the corresponding connection module can be removed. On reassembly, a clear assignment of all of the released connection modules to the corresponding module location is ensured on the basis of the coding and opposing coding means 9a-9d and 10a-10d.

The invention explained above can be summarized as follows: in order to specify a service device 1, which can be equipped with at least one connection module 7a-7d and has a contact means

16a, 16b, and in the case of which the possibly voltage-carrying contact means 16a-16b for the purpose of making contact with the connection

module 7a-7d which can be coupled and decoupled is intended to be protected against unintentional touching contact using simple means, provision is made for an insulating means 19a, 19b to be arranged on the end and/or longitudinal side of the contact means 16a, 16b.